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# AGRICULTURAL NEWS LETTER

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This publication gives information on new developments of interest to agriculture on laboratory and field investigations of the du Pont Company and its subsidiary companies.

In addition to reporting results of the investigations of the Company and its subsidiaries, published reports and direct contributions of investigators of agricultural experiment stations and other institutions are given dealing with the Company's products and other subjects of agricultural interest.

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## A NEW PEST CONTROL RESEARCH LABORATORY BEGINS WORK ON A WIDER RANGE OF INVESTIGATIONS AND EXPERIMENTS

EDITOR'S NOTE:- As is known, scientists of the du Pont organization have for a number of years carried on research and experiments with a view to developing new and more effective insecticides and fungicides for the control of insects and fungi which damage agricultural, forest and other products. In fact, the investigations cover a very wide range of "pests." In order to co-ordinate these investigations and to expand the program of pest control, there was organized the Pest Control Research Section of the Grasselli Chemicals Department of the du Pont Company. The staff is adequate to carry on the investigations at present.

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A laboratory building and a new greenhouse are now in use by the Pest Control Research Section of the Grasselli Chemicals Department, E. I. du Pont de Nemours & Company. Both structures are on the grounds of the du Pont Experimental Station, near Wilmington, Delaware. This station is the central chemical research organization of the du Pont Company.

The Chemical synthesis of new products, largely, is done under the supervision of the Experimental Station. The chemists of the station staff who cooperate in pest control activities work in laboratories on the grounds and, therefore, are enabled to observe the biological work of the Pest Control Research Section as frequently as is desired.

### Complete Laboratory Facilities

In the laboratory building are offices and laboratories for the entomologists and plant pathologists, and for chemists who do the compounding of pest control products for experimental use.

The several laboratories are equipped with the most modern facilities for evaluating pest control products. Special chambers and incubators for rearing insects and growing fungi are provided.

A laboratory is devoted to the compounding of experimental chemicals for satisfactory application as sprays or dusts. Special consideration is given to spreading and sticking agents and other assistants including inert carriers. Approximately 2,500 different chemicals and chemical compounds, which have been prepared and tested, are available in this laboratory for future reference or use. Others are being added. Due to the close proximity of the various laboratories of the du Pont Experimental Station, chemicals synthesized for other uses that may be useful in pest control can be readily obtained and the chemists responsible for their preparation are available for consultation.

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There is a laboratory specially equipped to carry on investigational work in connection with the evaluation of fungicides and bactericides. The study of termite control also is conducted in this laboratory. One room is set aside in the laboratory building for the rearing of flies for the evaluation of fly sprays. There is also an improved type of fly spray chamber, which eliminates some of the difficulties experienced with the standard type of chamber used in other laboratories.

## Special Chambers for Codling Moth and Japanese Beetle

A specially designed chamber equipped with automatic temperature and humidity control is provided for rearing codling moth larvae and conducting comparative tests of chemicals for codling moth control.

A special chamber is provided in the basement of the greenhouse for the evaluation of chemicals for the control of the Japanese beetle and certain other insects. Provision is made for the control of light, moisture and temperature. While this chamber is built along the general lines of the one used by entomologists of the United States Department of Agriculture at Moorestown, New Jersey, it includes a number of improvements. The elaborate equipment of the chamber permits experimenters to take advantage of the peculiar habit of the Japanese beetle of feeding at a maximum on bright hot days when the humidity is high. By controlling the light, temperature and moisture conditions, results can be obtained in two days that would require a week or more were experiments attempted without such control.

## A Greenhouse That Includes New Features

The greenhouse in certain important details of design and equipment marks an advance over other such structures for scientific research in this country. Also, there have been eliminated some of the unsatisfactory features of many of the greenhouses now in use for research purposes. The different sections are provided with automatic temperature control. By a special arrangement of the heating system excessive drying of the soil in beds and pots is prevented, and uniformity of temperature is maintained. These and other features provide for the growing of different kinds of plants and the rearing of different kinds of insects which require different temperatures. An expert greenhouse man is in charge.

The head house is not used solely as a potting section. It is equipped with such facilities as a spray outfit which duplicates fairly accurately the results of modern spray equipment now used in the field.

## An Adequate Staff Conducts the Work

The work of the Pest Control Research Section is under the direction of Dr. W. H. Tisdale, Manager. An adequate staff has been provided to handle the functions of the Section, such as preparation or synthesis of chemicals for pest control, compounding these newly synthesized chemicals for satisfactory application as dust or spray, preparation of wetting and spreading agents in form for use, and a compounding of coating agents for the preservation of fruit.

The staff also includes personnel to handle field investigations of insecticides, as well as fungicides and bactericides and termite control.

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## THE USE OF AGRICULTURAL COMMODITIES BY INDUSTRY AND SOME OF THE WAYS THAT SCIENCE HELPS FARMING

EDITOR'S NOTE:- Below is presented a portion of an address by Dr. Stine on the subject of "Chemistry and You" before the Business and Professional Men's Group of the College of Engineering and Commerce, University of Cincinnati, Cincinnati, Ohio.

By Dr. C. M. A. Stine, Vice-President,
E. I. du Pont de Nemours & Company.

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Today from one side we hear charges that chemistry is ruining the farm by synthesizing materials once produced exclusively from the soil, and that indeed the time is not distant when we will live not on natural but on synthetic foods. And from the other side we hear that agriculture's future lies in the chemical conversion of huge farm crops to industrial uses, in the transformation of wheat, corn and potatoes into factory raw materials for motor cars, fuels, buildings, roads and other as yet unheard-of things.

The truth of chemistry in agriculture lies somewhere between these extremes but it inclines more toward the second view. Food compounded in pills is a technical possibility now but a most remote practical probability. Man is too fond of meat, vegetables, fruit, milk and bread to desert them for centuries to come.

### Farm Crops Long Used by Industry

The chemical conversion of farm crops into factory materials is not new. It dates back at least to 1845 when Schoenbein made gun-cotton or nitrocellulose. Followed Celluloid, rayon, smokeless powder, pyroxylin plastics and finishes, and the literally thousands of things made today from the cellulose of cotton. It is estimated that cotton now goes to the retail market in no less than 10,000 forms and that the industrial consumption of cotton linters now approximates 500,000,000 pounds. The coated textile industry consumes more than 110,000,000 yards of cotton cloth yearly.

There is half a ton of seed produced to each bale of cotton and 50 years ago thousands of tons of cotton seeds for which no use could be found were dumped into Southern streams. Chemists devised ways to use the oil of cotton seeds in soaps, in cooking and salad oils, and later in butter and lard substitutes. The cotton seed crop is now worth $200,000,000 in a normal year to Southern farmers, and indeed all oil-bearing seeds have become valuable.

Parallel developments have converted a tenth of the corn crop to industrial uses, have made oat hulls a source of furfural for plastics, wheat straw a raw material for corrugated paper boxes, and sugar-cane bagasse and other fibrous stalks the chemical basis for wall boards used commonly in modern building insulation. Dozens of other examples might be cited to show that chemistry has long been interested in agricultural crops as likely raw materials for industry.

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However, the paradox is that the chemist's ability to convert crops to uses other than food is the smaller and less difficult part of the problem. The real difficulty is the farmer's, to grow and sell crops at prices low enough to make their conversion justifiable and economically practicable. Competition is keen in industry. Between raw materials of similar properties the industrial chemist has no choice other than the lowest price. Why for example make paper from cornstalks, which our grandfathers could do, when wood pulp costs much less and is more readily available? A big problem of the wholesale use of crops by industry is one of economics, as well as chemistry.

## Ways That Science Helps Agriculture

It is not easy to lower prices in an industry where they are already close to or even below costs of production. Nevertheless this can be done in agriculture. Losses suffered by farmers mount to almost unbelievable figures. More than 6,000 known species of insects cost growers each year something like $2,000,000,000. Thirty-four insect species alone cause a known damage of $924,000,000. Losses traceable to weeds are estimated at $3,000,000,000. Add to these figures another billion and a half chargeable to plant diseases, and the total of $6,500,000,000 is staggering.

Almost may it be said that for every dollar the farmer now earns he has another dollar taken from him by enemies against which he must wage ceaseless war. Chemistry is doing its utmost to help him save some portion of that dollar. New large-scale laboratories for an intensified study of better scientific means to control pests, weeds and plant diseases are even now being built. Some of our ablest scientists are accepting the challenge of the six and a half billion annual loss.

A new science in fertilization of the soil is being developed, as well as a wide range of improved chemical fertilizers, based on discoveries in soil chemistry that promise much in improving both the quantity and quality of yields. It has been found that the presence or absence of minute quantities of certain elements in the soil may determine the success or failure of a crop, or the health or disease of animals feeding on the land, or even of human beings who use the animals' meat as food. A science of plant genetics is being developed that will enable farmers to grow crops to order, ways of speeding up growth are being studied to permit shorter growing seasons and reduce losses from late and early frosts, better ways for preserving fruits and storing crops are being devised.

Like medicine and most of our manufacturing industries, agriculture too is in a state of transition from old methods to new, with chemistry furnishing the bridge for its progress.

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## ADAPTING HIGH ANALYSIS AND CONCENTRATED FERTILIZERS TO COTTON SOILS IS SUBJECT OF A PAPER AT NASHVILLE

EDITOR'S NOTE:- There is given below an abstract of a paper presented before the Agronomy Section, Association of Southern Agricultural Workers at the February meeting in Nashville, Tennessee. The paper was prepared jointly by J. J. Skinner, Bureau of Plant Industry, United States Department of Agriculture; H. B. Mann and E. R. Collins, North Carolina Experiment Station; E. T. Batten, Virginia Experiment Station, and R. P. Bledsoe, Georgia Experiment Station.

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The results of a series of experiments on cotton soils of the southeastern states covering a period of twelve years, planned to study the effects of concentrated fertilizers and means of improving them for cotton production, are reported.

In the earlier experiments it was shown that concentrated fertilizers on some soils were not as efficient as standard single-strength fertilizers for cotton. Consideration of the composition of some concentrated fertilizers indicates that the observed differences may not be due to differences in efficiency of the phosphoric acid and potash as plant nutrients. It was thought that the differences may be due to the source of nitrogen, equivalent acidity of fertilizers, content of secondary elements, calcium, magnesium and sulphur, or content of minor plant food elements, manganese, zinc, copper and boron.

In experiments on Cecil clay loam at Youngsville, N. C., Cecil sandy clay at Raleigh, N. C., and Norfolk sandy loam at Goldsboro, N. C., concentrated fertilizers which were acidic and calcium and magnesium free gave as good results as standard fertilizers in the early years of the experiments but declined in efficiency when used year after year. On a fertile soil at Holland, Virginia, such fertilizers gave good results during the entire seven year period of the experiment. The data for the entire series of experiments show that when concentrated fertilizers were properly supplemented with limestone or dolomitic limestone, and in some cases with magnesium sulphate, they were usually equal and frequently superior to standard strength fertilizers.

Soluble fertilizer salts within the plant's root zone resulting from the two grades of fertilizer varied with the soil. In machine placement of fertilizer experiments there was a greater concentration of soluble salts in the root zone during the early season from standard fertilizer than from double strength fertilizer. Fertilizer placement in bands to the side of seed and slightly below the seed level gave better results than placement in a band below the seed and mixed with the soil.

On most of the soils used in the experiments, the results indicate that differences in minor elements are unimportant in the relative efficiency of standard and concentrated fertilizers. Nor did the sources of nitrogen vary widely

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in their effect on cotton when the fertilizer was properly supplemented with limestone or dolomitic limestone. The largest yields were generally secured with concentrated fertilizers containing acid-forming inorganic or soluble nitrogen supplemented with the limestones. This result is in keeping with previous experiments which show that inorganic sources of nitrogen properly formulated may be as effective for cotton production as higher priced organic nitrogen, thus effectively reducing the cost of fertilizer to the consumer.

The results of these experiments are of economic importance. They indicate that properly formulated double-strength fertilizers are as efficient as single-strength fertilizers. As pointed out by scientific investigators, double-strength fertilizers cost considerably less per unit of plant food than single-strength fertilizers, both containing the essential plant food elements, including calcium and magnesium. The data indicate that their use in cotton production may be a factor in lowering cost of production.

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## THE PURPOSE AND PRACTICE OF SEED CORN TREATMENT WITH SOME OBSERVATIONS ON THE RESULTS AND VALUE

EDITOR'S NOTE:- This popular discussion of seed corn treatment is presented for the use of county agricultural agents and others who may be called upon to discuss the subject at farm group meetings or elsewhere. The material may be used in any manner desired, with or without credit to the author. It may be reprinted as a bulletin or otherwise.

By Gilbert F. Miles,
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For two or three hundred years grain growers have treated their seed grains with various chemicals to combat smuts and other diseases carried on the surface of the seed. The use of chemicals for the treatment of seed corn is of much more recent origin, the first successful introduction of this practice dating back only 10 or 12 years. So new, indeed, is the disinfection of seed corn that many growers are not yet fully aware of its purposes and advantages.

As in the case of most discoveries there were at first, and still are, some misunderstandings regarding the possibilities and limitations of seed corn disinfection. Perhaps we can clear up some of these by explaining first of all what seed treatment of corn will not do. For example, seed corn treatment, as the term is ordinarily used, is not a crow repellent; neither is it intended to prevent damage by gophers, squirrels, wire worms, or cut worms; nor will it control corn smut.

### The Purpose of Seed Corn Treatment

The ultimate purpose of treating seed corn is to improve the stands and increase the yields. To understand how the application of a chemical in dust form to the seed can accomplish this, it is necessary to appreciate one of the most common causes of poor stands and reduced yields. In our imagination let us walk up and down the rows in a typical corn field early in July, when the plants are eighteen inches or so in height. If we observe carefully, we shall see that there are some missing hills, some hills with only one stalk instead of two or three. We shall note, too, that here and there are plants which are weak, stunted, or with poor color. In some cases these weak plants have died at the time of our examination. While it is easy enough to see these missing hills and sickly plants, the cause of these troubles is not quite so apparent. As a matter of fact, to begin at the beginning of the story we should really start by looking at the seed instead of the plants.

If we examine in the laboratory by miscroscopic means an average sample of corn, we nearly always find on the surface of the seed very tiny bodies known as spores.

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These spores, so small that a hundred could group themselves on the head of a pin, are the reproductive bodies by which fungi or molds live over from one season to the next. Roughly speaking, we may think of spores as the seeds of fungi or molds.

These spores on our sample of seed corn may represent many different kinds of molds, some of which are not at all harmful to the corn crop, and others which may cause much damage and loss. As long as the seed corn remains dry, these spores simply lie dormant, just as does the seed corn itself.

While we cannot see these spores without the use of a microscope, we can see with the unaided eye what happens when they germinate and produce the molds, with which we are all familiar. Anyone who has run germination tests with untreated seed corn knows how quickly molds tend to overrun the seed. Upon germination under suitable conditions the spores push out a slender thread similar to the sprout of a seed. In the case of molds harmful to corn, this thread or sprout penetrates the germinating seed or seedling and sets itself up as a parasite, or non-paying boarder, living upon the substances intended to promote the growth of the young plant. This infection of the seed or seedling by the mold usually results in rotting the seed or stunting the young seedling. Thus, those missing hills and weak, yellowish plants are the effects of attacks by these destructive molds.

## The Effect of Treatment

So far, we have been attempting to explain briefly the cause for many poor stands and reduced yields. Now let's see what can be done about it. From what has been said, it will be apparent that if we can destroy disease-producing spores on the surface of the seed before planting, much of this loss can be avoided. The best means thus far devised for accomplishing the destruction of these tiny enemies of the corn crop is to apply to the seed before planting a suitable chemical, of which modern chemistry has made three or more available in dust form.

The application of dust disinfectants to seed is a simple operation, with which nearly all farmers are familiar. It consists essentially of rotating or shaking the seed and dust together for two minutes in any convenient dust-tight container such as a lard tin, drum, or discarded barrel-type churn. Two ounces of the dust disinfectant is the amount usually recommended to a bushel of seed corn.

## Tests by Agricultural Experiment Stations

Since the earliest introduction of seed corn disinfection methods some of the experiment stations have maintained a constant study of the various chemicals developed for this purpose. Among others, the Iowa and the Illinois Agricultural Colleges have conducted field tests year after year. The findings of the investigators as reported in the official publications of these and other institutions should be of unusual interest to growers because of the long period of time covered by their studies of seed corn treatment and its advantages.

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For example, the Iowa Extension Service has recently released the results of 9 years of testing with seed corn disinfectants. The tests included a total of more than 150 plots in several counties of the state. They report that the average yearly increases in yield as a result of seed corn treatment ranged from 2.8 to 6.3 bushels per acre, the average for the 9 years being four bushels. The cost of treating the seed for an acre is estimated as two to three cents.

The Illinois Experiment Station has conducted similar tests in that state for many years and reports for the northern two-thirds of Illinois an average increase in yield of about three bushels per acre as a result of treating seed corn.

Such results as those cited above should dispel any doubts in the minds of Corn Belt farmers as to the profitableness of curbing the activities of those destructive seed-borne diseases, which can and usually do reduce the stand and decrease the yield from untreated seed. Fortunate, indeed, is it for the corn grower that science has developed a control measure as simple and inexpensive as modern seed corn treatment.

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## FARM FIRE AND DUST EXPLOSION PREVENTION AND CONTROL SUBJECTS OF EDUCATIONAL CAMPAIGN BY FEDERAL AGENCY

EDITOR'S NOTE:- The work of the United States Department of Agriculture to save lives and prevent or minimize property losses in rural districts, as outlined here, is an activity that should enlist the hearty cooperation of all concerned with agriculture.

By L. F. Livingston, Manager,
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Agricultural engineers are keenly interested in the aggressive campaign of the United States Department of Agriculture to prevent farm fires and to handle them when necessary.

Methods developed by the Department's engineers for the control and prevention of dust explosions and agricultural fires are being explained to many groups by Dr. David J. Price of the Department. In meetings with firemen he is emphasizing dust explosion prevention during fire-fighting operations. He is demonstrating how dust explosions occur and is showing a sound motion picture of dust explosions.

Dr. Price is in charge of research work on dust explosions and farm fire prevention in the Chemical Engineering Division of the Bureau of Chemistry and Soils. He also is chairman of the National Fire Protection Association Committees on Dust Explosion Hazards and Farm Fire Protection.

### Schools for Rural Firemen Conducted

The Department of Agriculture is cooperating with the States in the establishment of schools for rural firemen to acquaint them with the latest improvements in fire-fighting and fire-prevention methods. These firemen's schools are an important undertaking, and reports indicate that fire losses are being reduced in sections of the United States where the schools have been held, Dr. Price says.

Special meetings have been held with firemen, college students, farm associations, industrial and safety organizations, fire prevention engineers, and other interested agencies. These meetings have been open to the public. They deal with reduction of losses from explosions and fires in handling, milling and storing agricultural products.

"The loss from fires on farms and in rural sections of the United States is more than 60 percent of the total national fire loss. In 1936 it placed a $16 'fire tax' on every farm in the country," says Dr. Price. Last year the property loss from fires on farms was approximately $100,000,000, and 3,500 lives were also lost, according to the Department of Agriculture.

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## Adequate Water Supply Needed for Fire Protection

The greatest handicap encountered in fighting fires on farms is a lack of water. Wells can not be depended upon, for modern fire equipment will quickly pump the average well dry. Therefore, there is need for the storage of water in adequate quantity as near as possible to farm structures.

Sometimes, a dam across a small stream will suffice to hold enough water. It may, however, be necessary to deepen the stream for a distance before erecting a dam. Thereby, greater storage capacity will be provided. Ponds can serve both for fire protection and as water holes for cattle. But it is best to have a separate pond, properly located, as a reservoir for water for emergency use.

In many cases, mechanical means -- or even hand labor -- may be used to make a pond or deepen a stream. Explosives offer an efficient and quick way to do the work.

Literature on the use of dynamite for every agricultural purpose is available and will be supplied on request to readers in the United States. It is regretted that the booklets and other printed matter are not for foreign distribution.

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